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Review

Sexual assault consultations – From high risk to high reliability

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ABSTRACT

- The sexual assault consultation is a high-risk procedure with the potential for errors resulting in harm to both patients and staff. As such, it can be likened to practices in high-risk industries such as aviation and surgery. In contrast to these domains however, the focus on performance safety and Threat and Error Management has not been widely adopted. This is despite a growing recognition of the vulnerabilities of the investigative and prosecutorial stages of alleged sexual assaults.
- In the context of "high risk" sexual assault consultations, the notion of safety refers not only to the risk of patient morbidity and mortality, but also to physical, psychological and judicial outcomes that affect patients, staff, and the wider community.
- This article identifies the latent threats present in sexual assault consultations and suggests a conceptual framework for application of Threat and Error Management in this specialised area of medicine. This will enable practitioners to be better equipped to recognise the risks and improve the performance and safety of sexual assault consultation processes.
- In an era of growing medicolegal concerns regarding issues such as environmental safety and the potential for contamination of cases, focussing on education and safety culture components within the investigative systems will allow sexual assault consultation processes to progress towards a new level of organisational reliability.

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1. Introduction

The sexual assault consultation is a unique area of medical practice. It is core work within the relatively new, but rapidly expanding field of Clinical Forensic Medicine. It requires expert knowledge and skills that traverse both the medical and legal arenas. In addition to seeing patients, the work invariably involves interactions with police, judiciary, other health and scientific personnel, and at times, even the media. Given the multidisciplinary context of the work, and the growth of the speciality, it is unsurprising that in recent years it has come under greater scrutiny and there has been an emerging recognition of the risks associated with sexual assault consultations.

Following a number of high profile cases that have exposed the vulnerabilities of the investigative and prosecutorial stages of alleged sexual assaults, a review of the framework within which forensic practitioners function is warranted. In many ways, sexual assault consultation practices can be likened to practices in high-risk industries such as aviation and surgery. Meticulous protocols are necessary to combat the many hazards and challenges of the work environments, and any errors that occur can have significant and long-lasting ramifications. Unlike aviation and surgery, however, the focus on performance safety, and threat and error management (TEM), has not been widely adopted in sexual assault consultation practices. As such, it is apropos that those working in the area look to those other industries and the initiatives they have taken for turning high risk into high reliability.

2. The high-risk environment

In a widely reported Australian case, an innocent man was convicted of rape on the basis of DNA evidence that was later found to have been contaminated from another case examined within the same clinical setting. In his subsequent inquiry into the

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circumstances surrounding the wrongful conviction, a Supreme Court judge remarked,[1]

> "It is almost incredible that, in consequence of a minute particle, so small that it was invisible to the naked eye, being released into the environment and then by some mechanism settling on a swab, slide or trolley surface, a chain of events could be started that culminated in the conviction of an individual for a crime that had never been committed…"

In that case, the concept of an entity so small as to be invisible, yet capable of triggering a catastrophic chain of events was a clear example to medical practitioners practising in the field of forensic medicine, of what other high-risk industries would have described as a "latent threat".

Latent threats are the inevitable "resident pathogens" within a system.[2] They are events or conditions that exist within an operational environment and attack the safety of the task performance. They can be hidden amongst professional cultures, attitudes, staffing, and organisational policies, procedures and environments. Unlike immediate or overt threats that emerge at the time of an event and are either anticipated or unexpected, latent threats can lie dormant within a system for many years, often only being recognised after an adverse event has occurred.

Errors and adverse events are distinct from each other in that "errors" are deviations from correctness whereas the term "adverse events" describes harm resulting from errors. James Reason's classic Swiss cheese model for hazards and losses clearly illustrates the relationship between the two, where hazards include latent and overt threats and errors, and losses represent adverse events.[2] When holes (hazards) in a series of barriers, safeguards and defences line up, they can be penetrated, and losses (adverse events) occur. The Australian contamination case exemplified the Swiss cheese model and the ensuing review of the case resulted in identification of multiple latent threats built into the system that allowed those events to occur.

The term "high risk" industries refers to those that by virtue of their function or environment are inherently dangerous.[3] The threats within their systems are manifold, and their errors can affect the safety of a small number or an entire population of people. Commercial aviation and surgery are two examples of high-risk industries. Though very different settings physically, they have in common a paramount requirement for safety in a complex and challenging environment. Since the 1970s, commercial aviation has taken a systematic approach to the identification of threats and ways to combat them. TEM models have been devised that acknowledge the criticality of each element of the system. After many years of examining the potential threats and proactively introducing countermeasures targeted at those threats, a remarkable level of safety has been achieved by the aviation industry.

Healthcare has been a decade or more behind the aviation industry in its attention to ensuring basic safety.[4] Despite the enormous human cost of errors in medical practice, healthcare has traditionally had a reactive approach to adverse events. Recently however, there has been a far greater emphasis placed by organisations on preventable errors and the most thorough attempts at applying a comparable systematic approach to safety has been in the operating theatre. Utilising lessons learnt from the aviation industry, medical and human factors researchers have adapted their TEM models to suit the medical environment (Fig. 1).[5]

Sexual assault consultations are similarly fraught with hazards that can result in adverse events. Examinations take place in challenging and changeable work environments; procedural

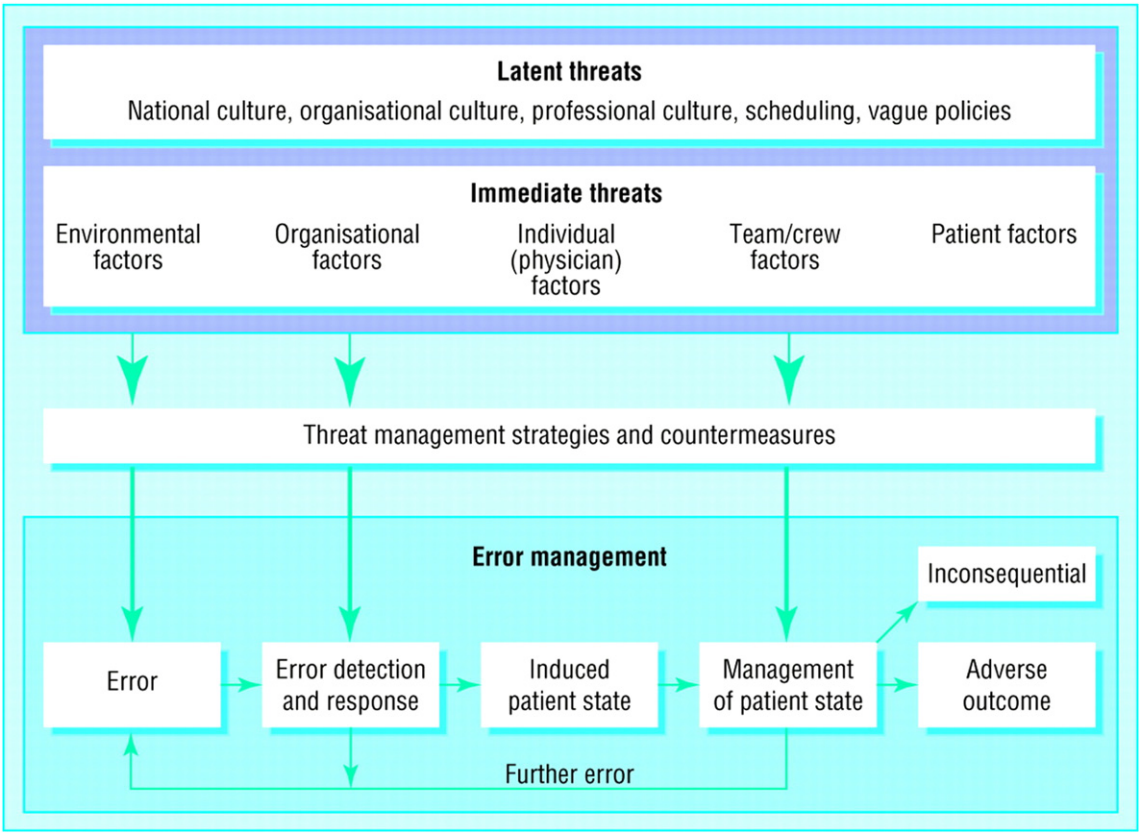

Fig. 1. Threat and error model. Reprinted with permission from Professor R. Helmreich.

Table 1
Summary of state and national attrition rates for sexual assault in Australia.

Investigative stage	Following initial complaints, offenders are proceeded against by police in <20% of cases.
Prosecutorial stage	<1 in 6 reports of adult rape proceed to prosecution.
Adjudication stage	Overall conviction rates for sexual assault are estimated at <5%.

precision is required at all times; protocols must be contemporary and specific; documentation can undergo meticulous scrutiny; technological advances shape the scope of practice; the course and outcomes of each case are often influenced by multiple factors that generally sit outside of the control of the practitioner; and the consequences of any errors can be severe. Therefore, just as in aviation and surgery, sexual assault consultations are undeniably "high risk".

The sexual assault consultation generally comprises five distinct components: examination and documentation of injuries; evaluation for sexually transmitted diseases; pregnancy prevention; arrangements for crisis intervention and follow-up; and collection of forensic evidence while maintaining proper chain of custody.[6] Within each of those components, there are numerous physical, emotional, scientific and medicolegal aspects to consider for each case. The forensic practitioner must be sensitive to the patient's physical and psychological trauma while avoiding partisanship. The subject matter often contends with multiple fallacies and taboos that can disaffect the entire process. To add to the complexity of sexual assault consultations, the patients, staff, and examination environment all possess untold variables that can adversely affect the medical or legal courses.

Reporting of sexual assault matters to police is notoriously low and has been consistently estimated at less than 20%.[7] Attrition of sexual assault cases from the criminal justice system can occur at the investigative stage, the prosecutorial stage, or the adjudication stage. Attrition rates in Australia are high and the decision to initiate and proceed with a prosecution is primarily evidentiary in nature.[8] The significant hazards within the system can contribute to the low reporting rates and high attrition rates for sexual assaults, and represent the losses in a TEM model. Examples of published attrition rates in Australia over the past decade are shown in Table 1,[9,10] and similar trends are reflected in other countries and jurisdictions.

In the context of "high risk" sexual assault consultations, the notion of safety does not only refer to the risk of patient morbidity and mortality. Safety encompasses a much broader classification that includes satisfactory patient outcomes in physical, psychological, and judicial terms. It also refers to the health and well-being of staff and the protection of the community from criminal elements.

3. The high reliability organisation

High reliability organisations (HROs) are those that achieve a consistent model of safety and avoid catastrophe where accidents would ordinarily be expected due to the risk factors and complexities inherent to the working environment. The consequences of errors are high yet the occurrence of errors is low.[11] Industries such as aviation were the first to embrace HRO concepts when operational failures led to large-scale disasters. Incorporating the challenges that organisations face in pursuing high reliability, the set of challenges and risks that are common to medical practices and HROs can be summarised into the following characteristics (Table 2).[12]

The successes of HROs lie in their ability to maintain "situational awareness". That is, they are mindful of the complexities of the systems in which they work and can rapidly identify any anomalies and problems. HROs recognise the range of problems that can occur and do not assume that failures are the result of a single, simple cause. They are proactive rather than reactive and draw on the expertise of their personnel. Finally, HROs display resilience and preparedness and acknowledge that despite considerable safeguards, the system can fail in unanticipated ways.[12]

For sexual assault consultations to attain a "high reliability" level of practice, would be to say that every patient receives the best quality of medical care and forensic investigation, every time. In pursuit of this goal, it is first essential to identify the specific issues relating to sexual assault consultations and apply a TEM approach to the system.

4. Bringing TEM into focus

Though the approaches of other high-risk industries to TEM are not directly transferable to the forensic setting, the underlying principles are universally applicable. Therefore, a conceptual flowchart can be designed to fit the unique challenges faced by forensic practitioners. Fig. 2 has been conceived by the author as a frame of reference for considering threats and errors in a forensic setting. In the centre of the flowchart, depicting the core of the entire process is the sexual assault consultation. In this setting, the threats can be divided into six key components: individual, team, system, patient, procedure and environment, with a number of identifiable threats in each (Table 3). Of particular note in the flowchart, the true percentage rates for error and adverse events in this area are unknown.

A recent and highly publicised case involving DNA contamination illustrates the threats surrounding forensic sampling and DNA evidence. In Germany, investigators uncovered matching DNA evidence from the scenes of multiple crimes (including murder) over a 15-year period between 1993 and 2009. The country braced

Table 2
Characteristics of high reliability organisations.

Hypercomplexity	HROs exist in complex environments where safety is dependent on multiple teams and systems
Tight coupling	HROs consist of tightly coupled teams that are each responsible for specific tasks that will affect the outcome
Extreme hierarchical differentiation	Roles within HROs are clearly differentiated and intensive efforts are required to ensure a cohesive function
Multiple decision makers in a complex communication network	HROs rely on effective communication between each component of the system
High degree of accountability	In HROs, errors are likely to have severe consequences
Need for frequent, immediate feedback	Opportunities need to exist for frequent feedback to teams within an HRO so that adjustments can be made to avert potential crises
Compressed time constraints	HROs face significant time pressures and their operational policies allow identification and management of such constraints
Higher workforce mobility	Where there is a high turnover in a workforce (such as in medicine), the importance of training and standardisation of equipment and resources is paramount
Care of patients rather than machines	This challenge is more specific to medical practice and recognises that patients can be immensely unpredictable and variable, and their behaviours can change over time

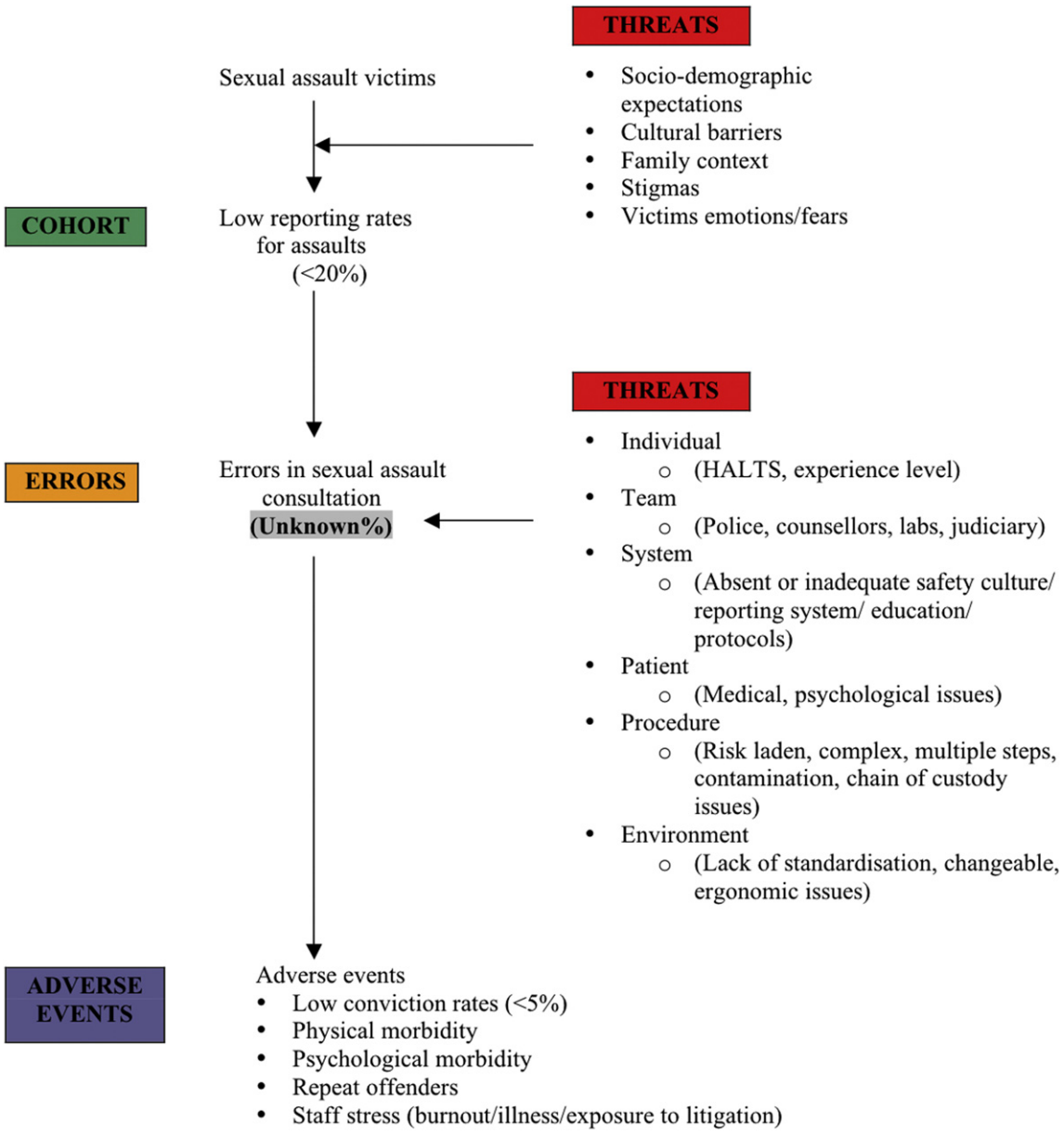

Fig. 2. Conceptual threat and error flowchart for sexual assault consultations.

itself for the possible existence of the worst serial criminal on record. A taskforce was set up to re-examine all the DNA evidence which was eventually shown to be contaminated and traced back to a female involved in the manufacture of the cotton swabs.[13] Further investigations revealed that not all conventional irradiation techniques resulted in the complete removal of amplifiable DNA in manufacturing sterilisation processes.[14,15] Due to errors at the manufacturing stage, the latent threats were so deeply embedded into the system that practitioners and investigators could not predict or detect the errors until multiple adverse events had occurred.

Concepts such as TEM and situational awareness have up until now been foreign to the majority of those practising in the area of sexual assault. Individuals may have been fearful of being confronted with a case of DNA contamination or have been frustrated at the outcome of a case, but may not have reflected on the threats and errors that contributed to the adverse events. In order to first identify and then remove hazards from the system, there needs to be a deliberate shift by organisations to embrace new ways of thinking. A key move is considering the environment in which the practitioner operates. The study of ergonomics (which focuses on the physical environment and the human body) and human factors (which centres on the cognitive aspects of human performance) are two related areas of research that examine the relationship between people and their work environment.[16] The design of a facility, including its technology and equipment, can have a significant impact on patient safety and human performance.[17,18] Until the design of the non-human elements of the system receive the same level of recognition as error barriers in human performance, environmental aspects will continue to contribute a source of harm.[19]

The true impact of threats arising from each of the six components of a sexual assault consultation is currently unknown. The list outlined in Table 3 is not exhaustive, and there are likely to be many

Table 3
Identifiable threats in the sexual assault consultation.

Individual	
Medicine law interface	Forensic practitioners are required to have a clear understanding of the local regulations and legal principles that govern forensic practices in their areas. Lack of appreciation for local and contemporary policies can threaten the function and quality of a forensic consultation. Attention to detail is necessary at all times from the visual inspection of a patient, to the collection of specimens, to the documentation and report writing (which is subject to far more scrutiny in the course of day-to-day practice than other areas of medicine and the repercussions following inaccuracies or oversights can be severe).
Individual prejudices and biases	Experiences, attitudes, and preconceived notions that may be formed when examining patients (e.g. a dishevelled, intoxicated, heavily tattooed, self-harming patient who alleges a sexual assault), can shape a practitioner's approach to a patient and be a source of latent threats.
Stress and fatigue	The acronym "HALTS" (hungry, angry, tired, late, stressed) refers to common error-producing latent conditions in the individual. Hospital staff working after hours; long shifts; with complex patients; or in unfamiliar environments; are at an increased risk of errors.[20–22] As sexual assault consultations are often lengthy and conducted at any hour of the day or night, it would not be unreasonable to extrapolate these findings to forensic practitioners.
Team	
Communication	In an operating theatre, a surgeon works with a team who generally remains unchanged and function under established communication channels. In contrast, forensic practitioners are likely to encounter input from multiple police, counsellors, laboratory staff, and officers of the court in the course of a single sexual assault investigation. Unless all the participants have been trained to recognise the need for a "team" approach to the investigation, the risk of errors are high in relation to communication issues between unfamiliar team members who approach issues from differing objectives and training backgrounds.
Team prejudices and biases	Similar to the potential threats carried by individual forensic practitioners, members of the multidisciplinary team who interact with sexual assault patients will bear their own latent threats.
System	
Research	Clinical research is restricted by the nature of the work: it is implausible to run prospective randomised controlled trials involving victims; and the intimate nature of the examination means that in the majority of cases, findings cannot be photographed or re-examined and correlated amongst peers. Barriers to adequate research time and funding may also be present. These factors lead to limitations in the system with respect to quality assurance, education, and the ability to form best practice guidelines.
Safety culture	Many sexual assault units have inadequate or absent safety cultures. Reporting systems and "no-blame" policies are lacking. Consistent strategies for reporting both within a unit and between various disciplines are necessary for identifying threats and trapping errors.
Patient	
Genito-anal injuries	These are uncommon following non-consensual sexual intercourse, are predominantly minor when present, and heal rapidly.[23–25] Thus the likelihood of identifying genito-anal injuries decreases markedly over time. Nevertheless, the presence or absence of injuries can significantly impact on court outcomes.[26,27] This disparity between the likelihood of examination findings and courtroom perceptions of the markers of sexual assault represents a latent threat.
History	Patients may not be forthcoming with details of the alleged assault; which will affect a practitioner's ability to obtain all the pertinent details.
Medical	Acute medical concerns, injuries, psychiatric symptoms, alcohol or substance misuse, and self-harm may need addressing during the consultation.[28] In addition to issues relating to pre-existing medical conditions, assault complications such as drug toxicities, head injuries or blood loss, can manifest during the consultation.
Safety	Violent tendencies or acute situational reactions can place staff at risk of harm from patients.
Risk groups	Patients that are more at risk of sexual assault (e.g. adolescents, the elderly, the institutionalised) also correlate with those consultations that are even more risk-laden due to the additional needs and challenges of those patient populations.
Expectations	Any interactions that take place with personnel prior to the consultation (e.g. counsellors, police members) have the potential to skew a patient's understanding and expectations of the forensic consultation. This can adversely affect the forensic practitioner's ability to engage the patient and focus on the relevant issues.
Procedure	
DNA evidence	Presentation of DNA evidence in a courtroom is a powerful discriminator.[29] DNA evidence can make critical differences in decisions on whether to prosecute and in jury findings.[30] As science becomes more sophisticated however, the risks of DNA evidence are higher. With the increasing sensitivity of DNA tests (less material required) are the concomitant threats of false positive results due to contamination.
Ownership	Forensic practitioners do not "own" their investigations and may not be privy to test results. Once collected, samples fall under the jurisdiction of the police investigation and the opportunity for review can be lost.
Collection of evidence	Evidence collection, labelling, packaging, and chain-of-custody procedures are all complex error-prone procedures.
Environment	
Medical emergency	Forensic practitioners may find themselves suddenly and unexpectedly faced with acute medical issues in an environment that is ill equipped to deal with emergencies.
Sterility	The cleanliness (or lack thereof) of the working environment can undermine the entire forensic process if any potential sources of contamination have not been identified and rectified.
Variability and unfamiliarity	Sexual assault consultations may at times need to be conducted in a number of different environments (e.g. emergency departments, intensive care units, mortuaries). Depending upon the extent of the geographical region that is covered by the forensic physician, there may exist a number of dedicated examination units. Intuitively, the concept of performing specialised tasks in multiple or unfamiliar environments is fraught with danger. This has become increasingly reflected in the literature where even subtle changes in environmental conditions (visual, olfactory or auditory cues) can affect outcomes, particularly when the operator is performing under stressful conditions.[31–34]
Ergonomics	The physical environment has an important effect on human performance. Poor ergonomics reduces efficiency and increases the chance of contamination.

Table 4
A new safety model for sexual assault consultations.

Education	
Develop a strategic plan for research needs	Statistical evidence in sexual assault research is difficult to corroborate for a number of reasons, and there is a disturbing imbalance in the ratios between prevalence rates for sexual assault and reporting or conviction rates. Research has addressed the question of how to improve the system for patients at the point of initial police contact and at their encounter with the courts, and there is emerging discussion about the interpretation of errors in the forensic sciences.[7–10,35,36] There is a dearth of literature however, on threats and errors in the intervening phase – the sexual assault consultation. This is therefore an unknown critical variable in the entire process and requires attention.
Identify error prevalence rates	Research into the impact of examiner error, forensic sampling errors, environmental factors, and the interplay between them in sexual assault cases is needed. The collection of more comprehensive statistics is critical to detecting problems as well as designing and monitoring safe practices in sexual assault consultations.
Generate consensus guidelines	Defining the standard of care that is expected amongst forensic practitioners and providing peer-accepted guidelines to all units will go some way to ensuring the quality of the staff and the robustness of their practices.
Focus on training	Not only is it imperative that adequate forensic training and supervision is provided, but also that there is a strong focus on TEM within the training modules. Empowering staff to recognise the high risks in their work will encourage a determinedness to achieve high reliability.
Safety culture	
Threat and error management models	A strong culture of safety is required for sexual assault consultations, as the work will affect many people and facets of the investigation. Advanced safety cultures utilise TEM models and are organised and systematic about how they manage their hazards.
Error reporting systems	It is crucial that systems are developed to measure errors and near misses – without detailed analyses, there is no way of uncovering recurrent error traps.[2]
"No-blame" culture	In many industries there has been a growing realisation that individuals are rarely to blame for mishaps that occur in the workplace. Mishaps are not random; they tend to fall into recurrent patterns. The same set of circumstances can provoke similar errors, regardless of the people involved.[2] Implementing a "no-blame" culture promotes willingness to report concerns and earlier identification of latent threats.
Environment	Introduce simulation for evaluation of ergonomic issues. In the field of surgery, clinicians and human factors experts have attempted to measure and optimise doctor–patient interfaces in the operating room using analysis of video capturing and time-motion studies. By identifying barriers to optimal workflow, an environment can be designed in a way that focuses primarily on reducing adverse events and improving patient safety.[16] The ergonomically designed sexual assault consultation room can assist in threat awareness by encouraging error identification and trapping behaviour (e.g. cross checking of labels, adequate position and lighting of examination bed, and workable demarcation zones for "clean" and "unclean" surfaces).
Centralisation	Over the past decade, there has been an extensive body of research published that supports the notion of centralising specialist expertise. Trauma units, stroke units, and cardiac catheterisation laboratories have all been shown to improve patient outcomes by funnelling specialised resources and expertise into a small number of locations rather than spread across multiple sites.[37–39] Centralisation would also arguably ease the erratic nature of the call-out component of the work thereby reducing the possibility of fatigue-related errors.
Cross-unit standardisation	Addressing environmental barriers and achieving cross-unit standardisation goes some way to easing workplace difficulties. Consideration of how sexual assault consultation rooms operate can expose the errors related to ergonomics and environmental design. Policies for staff familiarisation and room maintenance and cleaning will reduce the risk of contamination errors. Targeting latent errors by standardising equipment and facilities will improve patient and staff outcomes. The benefits of introducing national accreditation requirements for all sites would include transparency and early recognition of "high risk" practices.

more latent threats that will only be revealed by detailed analysis of each component of the system over time. What is known is that all threats and errors can lead to adverse events, which can have an immediate effect on patients and staff, an intermediate effect on investigations and a longer-term effect on court processes and the community. One or many people will suffer as a result of undetected and potentially avoidable threats.

5. A new model for sexual assault consultations

Latent threats are invariably ill defined and differ for each individual and situation. It is imperative that forensic practitioners protect themselves and their patients by knowing and preparing for potential threats. Individuals, teams and systems are all vulnerable to error in distinct and inter-related ways. The aim is to catch errors by building mechanisms into the system that allow identification of the errors. Given the ubiquity of threat and error in clinical settings, a clear and systematic model is required for improving safety and reducing adverse events. The model should focus on the key areas of education and safety culture (Table 4). Education should involve the development of a strategic plan for research needs; the identification of error prevalence rates; generation of consensus guidelines; and a greater focus on training. Safety Culture refers to the application of TEM models; the ability to devise error reporting systems; encouraging a "no-blame" culture; and addressing aspects of the environment; centralisation; and cross-unit standardisation. The overall objective would be to achieve the four dimensions of an advanced safety culture resulting in a workplace that: (1) is informed at all levels (by seeking and providing information), (2) exhibits trust by all (by being just and informed), (3) is adaptable to change (by being flexible and learning from what goes well and what goes badly), and (4) worries (by not allowing success to engender complacency).[3]

6. Conclusion

Forensic practitioners are all too aware of the limitations and complexities of the framework within which they work. The fundamental question is whether the speciality accepts the many shortcomings and risks in the work environment, or chooses to become proactive in identifying and addressing recurring themes. Improving safety and awareness is of vital importance in the field of sexual assault consultations as the potential adverse events can be devastating.

The first step is to bring TEM into focus in the forensic workplace. The next step is to conceptualise high-risk sexual assault consultations within the context of a TEM model and identify the invisible entities. Without "big picture" thinking and proactive, detailed analyses, latent threats are hard to find. The final goal is to make the concept of TEM central and explicit in sexual assault

consultation practices, and program the concepts of high reliability into the organisational psyche.

> *"We cannot change the human condition, but we can change the conditions under which humans work"*
>
> J. Reason (2000).

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None identified.

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